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8 May 1968

MEMORANDUM FOR: Director of Training

THROUGH: DBI Planning Officer

SUBJECT: Proposed Mathematical Training Course for Geographers

1. During the past 10 years the Geography Division, Office of Basic and Geographic Intelligence, has become increasingly involved in geographic research projects related to scientific intelligence and space intelligence activities. Some of these projects reflect a demand for more precise analysis of earth phenomena. Others represent geographic use of the new methods now coming into existence for gathering data from space and for conveying this information promptly to users in the form of intelligence. With the advent of the satellites, missiles, exploration of the oceans, and the future manned trips to the moon, this Office foresees an increasing need to strengthen its capabilities in the field of mathematical geography.

2. Some typical project requests currently being placed upon our geographic researchers that require a knowledge of mathematical geography for their solution are outlined as follows:

a. Line-of-sight relationships involving radio, radar, and optical communication which might be obstructed by intervening topography.

b. Effect of the earth's curvature upon viewing a distant object.

c. The determination of the trace of a satellite orbit upon the earth's surface.

d. Determination of precise distances between points anywhere on the earth.

e. Problems involved in planning of optimum areas and conditions for selected photographic programs.

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3. The Office of Basic and Geographic Intelligence has reviewed its present capabilities and requirements for personnel trained in the field of mathematical geography -- especially in view of the situation that has developed since the recent retirement of our most capable employee in this field -- and is of the opinion that an urgent need exists for our geographers to obtain further training in this scientific field. The following training proposal is therefore being submitted to the Office of Training for consideration as an approved Agency Training Course.

25X1A9a 4. It is proposed that this Office initiate a personal service contract with [REDACTED] a former employee who has had over 20 years' experience in this scientific field, to present an in-house training course during duty hours, twice a week, 2 hours per day, and covering approximately 10 weeks. It is estimated that there would be one class of 12-15 students during the 10-week period from 16 September 1968 to 22 November 1968. For some people the course would constitute a refresher; for others it would provide needed basic training. The training would proceed subject-wise through the following phases, with emphasis upon practical geographic intelligence applications as experienced in CIA:

a. Algebra

- (1) The conventional symbols of algebra
- (2) Fundamental operations with symbols
- (3) Grouping of symbols and the concept of functions
- (4) Systems of linear equations and methods of solution
- (5) Quadratic equations and their solution
- (6) Selected problems derived from geography

b. Plane Geometry

- (1) The basic logic process of geometry
- (2) Theorems involving angles
- (3) The plane triangle and solution for its elements when some are known
- (4) The importance of the Pythagorean theorem
- (5) Theorems involving circles and triangles

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c. Solid Geometry

- (1) The extension of the principles of plane geometry to three dimensions
- (2) Geometry of the trihedron
- (3) Various solid geometric figures familiar in everyday experience
- (4) How the earth is studied as a solid geometric figure

d. Plane Trigonometry

- (1) The standard notations of trigonometry
- (2) The right triangle
- (3) The oblique triangle
- (4) Laws of sines and cosines
- (5) Many applications of these laws to geography of the earth
- (6) Lengths of meridian arcs

e. Spherical Trigonometry

- (1) Basic concepts applied to the spherical surface
- (2) The right spherical triangle
- (3) The oblique spherical triangle
- (4) Laws of sines and cosines
- (5) Distances between points on a sphere
- (6) The figure of the earth as defined by trig functions

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f. Astronomy

- (1) The earth as an astronomic body
- (2) The earth as a member of the solar system
- (3) Time and its measurement
- (4) The velocity of light as a fundamental constant of nature
- (5) The earth-moon relationship
- (6) The dynamics of motion in space
- (7) Problems of man's adjustment to a space environment

5. It should be pointed out that the ultimate benefits to be derived may not be apparent until after the trigonometry phase of the course. The astronomy unit is essential because of the need to incorporate space concepts into the geographers' background. Also, the amount of subject matter of relevance would be worked into each course, depending upon the time allocated and the progress of the students.

6. There are only a limited number of academic courses available at the present time which relate to this special field of geography. The present mathematics courses offered through the Agency and the Department of Agriculture Graduate School do not adapt well to the problems and requirements of the geographer. The Civil Service Commission mathematics courses are oriented toward managers only. This subject field is highly specialized and can be most economically and effectively handled in-house, where classified, job-related material and equipment can be utilized.

7. The classes would be conducted in the Geography Division, OBGI, Magazine Building, Rosslyn, Virginia. If security considerations permit, the use of a 6th floor OTR classroom facility may be requested. There will be no grades or testing; however, 15 copies of a textbook may be required for the class.

25X1A9a 8. [REDACTED] educational background and teaching experience follows:

a. Education

University of Chicago, BS, [REDACTED] Mathematics - Physics.  
University of Chicago, MS, [REDACTED] Mathematics - Physics.  
Ohio State University, [REDACTED] Three semester courses in  
Photogrammetry and Geodesy.

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U.S. Department of Agriculture Graduate School,  
[REDACTED] Courses in Aerial Photographic Interpretation and Geodesy.

Georgetown University Graduate School, [REDACTED] Four 25X1A9a  
semester courses in Advanced Geodesy.

b. Teaching Experience

Illinois Institute of Technology, [REDACTED]; Evening 25X1A9a  
School, Instructor of Mathematics.

9. It is our belief that mathematical geography is an essential tool for the geographer, particularly in this period of space research that promises extension of the environment of man. A basic understanding of the mathematical procedures is therefore a necessary part of the training required for modern geographers. This course will raise the competence of those participating to a level deemed adequate for the performance of OBGI routine tasks of mathematical geography.

(signed)  
JAMES A. BRAMMELL

JAMES A. BRAMMELL  
Director  
Basic and Geographic Intelligence

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